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Original Article

A Clinico-epidemiological Profile of Dyslipidaemia and its Association with Temperament - A Cross Sectional Study

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ABSTRACT

Introduction: Dyslipidaemia is directly associated with cardiovascular diseases. Temperament, the unique constitutional make-up of an individual, is responsible for one's personality traits, physical appearances, and disease predispositions. The rising prevalence of dyslipidaemia becomes a challenge to control morbidity and mortality due to cardiovascular diseases.

Objective: To study clinical patterns and risk factors of dyslipidaemia and its association with temperament at the individual level was the main objective of this study.

Materials and Methods: It was a descriptive and analytical cross sectional study. The participants (n=88) were screened on the basis of raised serum lipid profile from the outpatient department of National Research Institute of Unani Medicine for Skin Disorders, Hyderabad. The data were collected on a case record form designed for this study and analyzed retrospectively.

Results: In this study, there were 57% participants (n=50) of phlegmatic temperament in which mean total cholesterol, triglycerides, low density lipoprotein- cholesterol and high density lipoprotein-cholesterol were 230.92 (±49.48) mg/dl, 182.34 (±110.61) mg/dl, 153.24 (±50.21) mg/dl and 46.3 (±10.83) mg/dl respectively.

Discussion: This study showed the prevalence of different clinical patterns of dyslipidaemia in the population and the phlegmatic participants were dyslipidaemic in a higher percentage. The prevalence of dyslipidaemia in phlegmatic participants may be linked to the constitutional make-up of the individual. The temperament of an individual may be considered as one of the risk factors for dyslipidaemia.

Conclusion: It was concluded that the temperament of an individual may be used as a screening tool to predict the individual's tendency to develop dyslipidaemia.

Keywords Cardiovascular diseases, cholesterol, dyslipidaemia, obesity, temperament, Unani

INTRODUCTION

Dyslipidaemia is a disorder of lipid and lipoprotein metabolism, which includes lipid and lipoprotein overproduction or deficiency. It is manifested by an increased level of serum total cholesterol (TC), triglycerides (TG), or a decreased level of high-density lipoprotein-cholesterol (HDL-C) (Fodor, 2011; Munjal, 2012). The rising incidence and prevalence of dyslipidaemia become a major health concern in the 21st century. It has been established that dyslipidaemia is an independent and important modifiable risk factor for cardiovascular diseases such as coronary artery diseases (CAD) and stroke.(Paccaud *et al*., 2000) In addition, prolonged dyslipidaemia has also been linked to the development of atherosclerosis (Abd *et al*., 2018; Garg *et al*., 2015), hypertension (Otsuka *et al*., 2016), nephropathy (Kawanami *et al*., 2016), retinopathy (Chang & Wu, 2013), diabetes mellitus (Hirano, 2018), obesity (Berawi *et al*., 2018), pancreatitis (Pretis *et al*., 2018), fatty liver, and so on. Dyslipidaemia affects 39% population around the world. It causes approximately 2.6 million deaths (4.5% of total deaths) and causes 29.7 million disability adjusted life years (DALYS)-2.0% of total DALYS. It is estimated that if serum total cholesterol level is reduced to 10% from the baseline in men aged 40 years, there is a chance that heart diseases are reduced up to 50% in the next 5 years (WHO, 2016).

Obesity is a phlegmatic disease. Phlegmatic individuals are prone to develop dyslipidaemia (Hoosen M, 2017). Karthikeyan G *et al*. reported in a case control study (INTERHEART study) on Asian people that the high level of total cholesterol, apolipoprotein B, low density lipoprotein, and non-high-density lipoprotein cholesterol was associated with acute coronary artery diseases. It was also reported that coronary artery diseases are inversely associated with an increased level of high-density lipoprotein cholesterol and apolipoprotein A (Karthikeyan *et al*., 2009).

Dyslipidaemia is directly associated with obesity (Bays *et al*., 2013). World Health Organization reported that one in six adults is obese and overweight worldwide. Obesity causes the death of nearly 2.8 million individuals and 35.8 million (2.3% of global)

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DALYS yearly (WHO, 2011). In India, more than 135 million individuals are obese. According to ICMR-INDIAB study 2015, the prevalence rate of obesity and central obesity are varying from 11.8% to 31.3% and 16.9% to 36.3% respectively (Ahirwar & Mondal, 2019).

Temperament is the individual's unique constitutional make-up that is responsible for one's personality traits, physical appearances, and disease predispositions. It is an essential parameter for disease prevention, treatment, restoration, and promotion of health (Hoosen M, 2017). Galen practiced this concept and it becomes an important guiding principle of Unani System of Medicine (USM). But in conventional medicine, temperament is not considered after the development of laboratory methods to explore physiological and pathological processes.

Several strategies have been adopted for the early detection of dyslipidemic patients as a preventive approach. Waist hip ratio, waist circumference/height ratio (Saeed, 2013), waist circumference, abdominal diameter, waist-to-thigh ratio, and Body Mass Index (BMI) (Sarkar *et al*., 2015) are used as screening parameters to detect dyslipidaemia. In this study, an attempt has been made to observe a demographic and epidemiological aspect of dyslipidaemia in south Indian population. Moreover, an attempt has also been made to find out the association of temperament and dyslipidaemia at the individual level so that it could be used as a screening parameter to predict the occurrence of dyslipidaemia and prevent cardiovascular diseases. Any observational study to predict the occurrence of dyslipidaemia on the basis of the temperament of an individual has not ever been reported.

MATERIALS AND METHODS

We conducted a descriptive and analytical cross sectional study to understand the demographic and epidemiological profile of participants diagnosed with dyslipidaemia. The data were collected as part of the screening of the participants for a clinical study during 1st July 2019 and 31st July 2020 from the outdoor patient department of National Research Institute of Unani Medicine for Skin Disorders, Hyderabad. Institutional Ethics Committee approved the protocol of this study. The participants submitted the signed informed consent form for participation in the study. We enrolled 88 consecutive participants with dyslipidaemia in the study. Participants aged between 30 years and 60 years with deranged lipid profiles were included in the study. The participants with diabetes mellitus, hypertension, and cardiovascular disorders were excluded from the study. The information like demographics, lifestyle related risk factors, body mass index (BMI), alcohol and smoking habits were collected through a predesigned case report form. The participants were without shoes and heavy outer garments at the time of height and weight measurement. Body mass index (BMI) was calculated as weight divided by height squared (kg/m2). Blood pressure (BP) was measured at least 15 min after rest in a quiet environment. BP values were recorded to the nearest 2 mm Hg with diastolic BP being determined at the beginning of Korotkoff phase V. The physician assessed the temperament of the participants on the basis of physical, physiological, and psychological characteristics of the participants. The questionnaire based on the 10 points parameters used in the study to assess the temperament of the participants has been shown in Table 1. (Anonymous, 2016) After 12-hour fasting blood sample was collected from each participant and serum lipids level was analyzed using ERBA-EM 200 Fully biochemistry Auto Analyzer. The collected data were analyzed retrospectively. The findings of this study were compared with the findings of similar previous published studies. Statistical analysis: Statistical analyses were performed using Microsoft Excel 2016. Descriptive statistics were calculated to describe the basic features of the data. Results of continuous data were expressed as means and standard deviation. Categorical data were presented as a percentage.

Table 1. Parameters for assessment of temperament (mizāj) (Anonymous, 2016)

Parameters	SANGUINE	PHLEGMATIC	BILIOUS	MELANCHOLIC
Complexion	Ruddy (Reddish/ Whitish Brown)	Chalky(Whitish)	Pale (Yellow)	Purple (Blackish)
Built	Muscular & Broad	Fatty & Broad	Muscular & Thin	Skeleton
Touch	Hot & Soft	Cold & Soft	Hot & Dry	Cold & Dry
Hair	Black & Lustrous, thick, Rapid growth	Black & Thin Slow Growth	Brown & Thin, Rapid Growth	Brown & Thin, Slow Growth
Movement	Active	Dull	Hyper-active	Less active
Diet (most liked)	Cold & Dry	Hot & Dry	Cold & Moist	Hot & Moist
Weather (most suitable)	Spring	Summer	Winter	Autumn
Sleep	Normal (6-8 hours)	In excess	Inadequate	Insomnia
Pulse	Normal in rate (70-80/min) Large in Volume	Slow in rate (60-70/min) Normal in Volume	Rapid in rate (80-100/min) Normal in volume	Slow in rate (60-70/min) Less in volume
Emotion	Normal	Calm & Quiet	Angry	Nervous

RESULTS

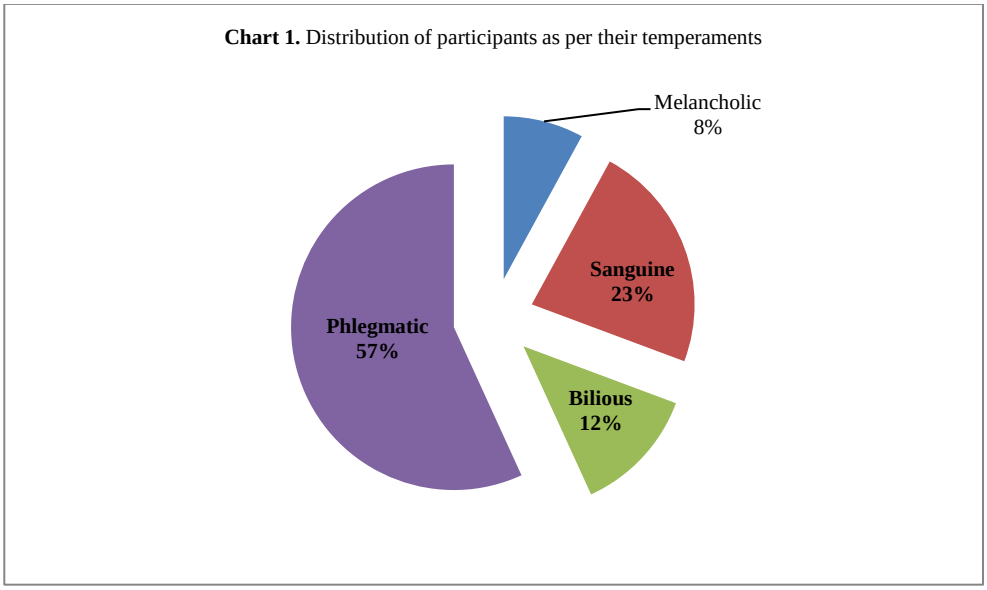
The demographic and epidemiological characteristics of the participants (n=88) have been described in Table 2. It was observed that there were 43 males (48.86%) and 45 females (51.13%) in this study. The mean age of the participants was 41.5(± 8.54) years. The average weight of the male participants was 77.97 (±12) Kgs versus 77.4 (± 10.42) Kgs in females. The mean body mass index (BMI) of male and female participants was 27.34 (± 4.58) kg/m2 and 31.56 (± 4.82) kg/m2 respectively. Out of 88 participants, 79 participants (89.77%) were non-vegetarian. Chart-1 shows the frequency of the participants according to their temperament. There were 50 phlegmatic participants (56.81%) followed by 20 sanguine participants (23%), 11 bilious participants (12%) and 7 melancholic participants (8%) in our study. Furthermore, the participants were classified into five groups on the basis of their socio-economic status as per the modified kuppuswamy socio

economic scale 2019. 36 participants (40.90%) belonged to a lower middle class followed by 30 participants (34.09%) to upper middle class and 14 participants (15.90%) to the lower class. In this study, 29 participants (33%) had an addiction to smoking, tobacco chewing, and alcohol. The mean systolic and diastolic blood pressure of the participants was 126 (± 8.59) mm Hg and 80 (± 6.72) mm Hg respectively.

Table 2. Epidemiological and demographic characteristics of the participants

Particulars	Values
No of Participants	88
Males	43 (48.86%)
Females	45 (51.13%)
Age	
Mean (± S.D)	41.5 (± 8.54) years
Range (in yr)	30-60 years
Average (± S.D) weight (kg)	**77.68 (± 11.16)**
Males	77.97 (±12)
Females	77.4 (± 10.42)
Average (± S.D) height (cm)	**162.84 (± 9.33)**
Males	169.20 (± 8.15)
Females	156.75 (± 5.58)
Average (± S.D) BMI (kg/m^2)	**29.50 (± 5.14)**
Males	27.34 (± 4.58)
Females	31.56 (± 4.82)
Systolic Blood Pressure, mean (± S.D) (mmHg)	126 (± 8.59)
Diastolic Blood Pressure, mean (± S.D) (mmHg)	80 (± 6.72)
Vegetarian	09 (10.22%)
Non-Vegetarian	79 (89.77%)
Upper (I)	4 (4.54%)
Upper Middle (II)	30 (34.09%)
Lower Middle (III)	36 (40.90%)
Upper Lower (IV)	4 (4.54%)
Lower (V)	14 (15.90%)
Cigarette Smoking	10 (11.36%)
Alcoholic	04 (4.54%)
Tobacco Chewing	07 (7.95%)
Pan & Betel Nut	08 (9.09%)
No Addiction	59 (67.04%)

Chart 1. Distribution of participants as per their temperaments



The lipid profiles of the participants are displayed in Table 3. The mean total cholesterol, triglycerides, low density lipoprotein- cholesterol and high density lipoprotein-cholesterol of the total participants were 225.01 (±51.04) mg/dl, 175.98 (±96.99) mg/dl, 147.02 (±51.9) mg/dl and 45.98(±12.08) mg/dl respectively. In this study, it was observed that mean total cholesterol among male and female participants was 215.37 (±46.99) mg/dl versus 234.17 (±53.52) mg/dl and mean low density lipoprotein- cholesterol 134.19 (±48.36) mg/dl versus 159 (± 52.73) mg/dl and mean high density lipoprotein-cholesterol 44.93 (±12.64) mg/dl versus 46.91 (±11.50) mg/dl.

Table 3. Lipid profiles of the participants

Particulars	Mean (±S.D) (mg/dl)
Total Cholesterol (TC) (n=88) Males Females	225.01 (±51.04) 215.37 (±46.99) 234.17 (±53.52)
Triglycerides (TGs) (n=88) Males Females	175.98 (±96.99) 193.13 (±110.90) 159.77 (±79.39)
Low Density Lipoprotein-Cholesterol (LDL-C) (n=88) Males Females	147.02 (±51.9) 134.19 (±48.36) 159 (± 52.73)
High Density Lipoprotein-Cholesterol (HDL-C) (n=88) Males Females	45.98(±12.08) 44.93 (±12.64) 46.91 (±11.50)
TC/HDL (n=88)	5.09 (±1.59)

In our study, 26 participants (29.54%) showed isolated hypercholesterolemia (LDL cholesterol ≥200 mg/dl). Hypertriglyceridemia (>150 mg/dl) was present in 8 participants (9.09%) whereas isolated low HDL (≤40 mg/dl) was observed in 5 participants (5.68%) only. Mixed hyperlipidaemia (hypercholesterolemia and hypertriglyceridemia) was present in 23 participants (26.13%). Table 4 shows the pattern of dyslipidaemia in the participants.

Table 4. Frequency of participants according to the pattern of dyslipidaemia

S. No.	Pattern of dyslipidaemia	Number of participants		
		Male (n=43)	Female (n=45)	Total (n= 88)
1.	Hypercholesterolemia	12 (27.90%)	14 (31.11%)	26 (29.54%)
2.	Hypertriglyceridemia	02 (4.65%)	06 (13.33%)	08 (9.09%)
3.	Isolated Low HDL	01 (2.32%)	04 (8.88%)	05 (5.68%)
4.	Isolated High LDL	01 (2.32%)	02 (4.44%)	03 (3.40%)
5.	Mixed Hyperlipidaemia (>TC and TG)	11 (25.58%)	12 (26.67%)	23 (26.13%)
6.	Mixed Hyperlipidaemia (> TG, TC and low HDL)	04 (9.30%)	04 (8.89%)	08 (9.09%)
7.	Mixed Hyperlipidaemia (>TG and <HDL)	09 (20.93%)	01 (2.22%)	10 (11.36%)
8.	Mixed Hyperlipidaemia (>TC and <HDL)	03 (6.97%)	02 (4.44%)	05 (5.68%)

The serum lipid levels of the participants classified on the basis of their temperament have been displayed in the Table 5. The mean total cholesterol, triglycerides, low density lipoprotein-cholesterol and high density lipoprotein-cholesterol of the phlegmatic participants were 230.92 (±49.48) mg/dl, 182.34 (±110.61) mg/dl, 153.24 (±50.21) mg/dl and 46.3 (±10.83) mg/dl respectively. When compared with the total participants (n=88), the mean total cholesterol, triglycerides, and low density lipoprotein- cholesterol were higher in phlegmatic participants. The mean total cholesterol/HDL-C ratio was 5.50 (±2.37) in sanguine participants followed by 5.4 (±1.15) in bilious participants, 5.04 (±1.27) in phlegmatic participants and 3.71 (±0.45) in melancholic participants. In our study, mean total cholesterol was 233.35 (±61.90) mg/dl in sanguine participants, 191.27 (±37.98) mg/dl in bilious participants and 212 (±20.55) mg/dl in melancholic participants. The mean triglyceride [182.34 (±110.61) mg/dl] was highest in participants of phlegmatic temperament. When compared mean BMI among the four groups of participants, the phlegmatic participants had the highest mean BMI [31.30 (±5.19) kg/m2].

Table 5. Lipid levels of the participants according to their temperament (mizāj)

Temperament (*Mizāj*) of the participants	TC Mean (±SD) (mg/dl)	TGs Mean (±SD) (mg/dl)	LDL-C Mean (±SD) (mg/dl)	HDL-C Mean (±SD) (mg/dl)	TC/HDL-C Mean (±SD)	Average BMI (±SD) kg/m^2
Phlegmatic (n=50) (Balghamī)	230.92 (±49.48)	182.34 (±110.61)	153.24 (±50.21)	46.3 (±10.83)	5.04 (±1.27)	31.30 (±5.19)
Sanguine (n=20) (Damawī)	233.35 (±61.90)	179.3 (±76.63)	151.55 (±63.21)	47 (±14.41)	5.50 (±2.37)	28.83 (±3.73)
Bilious (n=11) (Ṣafrāwī)	191.27 (±37.98)	153.45 (±54.54)	125.54 (±42.00)	36.09 (±8.61)	5.4 (±1.15)	25.34 (±2.74)
Melancholic (n=07) (Sawdāwī)	212 (±20.55)	156.57 (±105.81)	124.28 (±31.71)	56.42 (±7.67)	3.71 (±0.45)	25.12 (±4.79)

DISCUSSION

The present study focused on socio-demographic, clinical and epidemiological profile of dyslipidaemic participants. In this study, the average age of the participants was 41.5 (± 8.54) years and the age ranged between 30-60 years. Our study showed that dyslipidaemia was prevalent in individuals aged between 30-60 years. Our observation is similar to the observations reported in several studies conducted for the Indian population (Alam *et al*., 2020; Mahalle *et al*., 2014). In addition, this study showed that

the prevalence of dyslipidaemia in male and female gender was in the ratio 1:1. This observation does not correspond with previous studies wherein male were more dyslipidaemic that female (Alam *et al*., 2020; Mahalle *et al*., 2014). This study revealed that the mean body mass index (BMI) amongst male and female was 27.34 (± 4.58) kg/m2 vs 31.56 (± 4.82) kg/m2 respectively. The data showed that BMI in female was higher than that of male. In other words, it can be said that females are prone to develop dyslipidaemia. It has already been reported that dyslipidaemia is directly related to obesity (Carr & Brunzell, 2004).

In the present study, it was observed that majority of the dyslipidaemic participants were of the middle class family as per their socio-economic data. This study reported that 36 participants (40.90%) belonged to a lower middle class followed by 30 participants (34.09%) to upper middle class family. Several previous studies have reported that dyslipidaemia is common amongst the urban population and higher and middle class families. In such a population, various risk factors are responsible for the development of dyslipidaemia such as high caloric diet, sedentary lifestyle, addiction of tobacco, smoking and so on.

Addiction of smoking, tobacco, betel nut and alcohol has been linked with dyslipidaemia in previous epidemiological studies conducted in the Indian population (Carr & Brunzell, 2004). In our study, 33% of participants had an addiction of smoking or tobacco or betel nut and/or alcohol of different duration. The majority of them were male.

It is reported that the total cholesterol (TC) to high density lipoprotein (HDL) ratio better predicts the occurrence of CVD events than measurements of total cholesterol or HDL alone (Paccaud *et al*., 2000). In this study, the mean total cholesterol (TC) to high density lipoprotein (HDL) ratio was 5.09 (±1.59). If the total cholesterol (TC) to high density lipoprotein (HDL) of the participant is higher than 5, it predicts that the participant is at higher risk of development of cardiovascular disorders. Our study reported the prevalence of clinical patterns of dyslipidaemia in the south Indian population.

In the present study, the percentage of the phlegmatic participants (57%) was highest among the four groups. It is hypothesized that the phlegmatic individuals are vulnerable to obesity which is directly associated with dyslipidaemia. The temperament of an individual is considered to be directly connected to the health or disease of the body, diet, medication, seasons, and prophylactic measures. All the various physiological and pathological functions within the body influence temperament of the individual. So it is essential to maintain health; the normal temperament within cells, tissues, organs and the entire body is to be achieved (Hoosen M, 2017). In this study, when the risk factors were compared among the four temperament groups, it was observed that phlegmatic participants had the ratio of total cholesterol (TC) to high density lipoprotein (HDL) greater than 5, highest mean serum triglycerides and greatest average BMI in comparison to the other three groups of participants. The variables such as TC/HDL, mean triglycerides and BMI may directly predict the risk of cardiovascular diseases in phlegmatic participants. In this study, it was observed that there existed a relationship between the temperament of an individual and the tendency of development of dyslipidaemia. This relationship could be utilized to detect dyslipidaemia at an early stage. It is well known that family history of hypercholesterolemia (Chou *et al*., 2016), Waist hip ratio, waist circumference/height ratio, waist circumference, abdominal diameter, waist-to-thigh ratio, and Body Mass Index (BMI) are used for screening asymptomatic dyslipidaemia. (Paccaud *et al*., 2000). This study demonstrated that dyslipidaemia was common in phlegmatic individuals. In other words, it can be said that the phlegmatic individuals have tendency to develop dyslipidaemia. Furthermore, we may conclude that one's temperament is a risk factor for dyslipidaemia, obesity, and cardiovascular diseases.

Dyslipidaemia is initially asymptomatic. It is to be identified before the development of cardiovascular diseases at an early age. Early detection of dyslipidaemia may enable us to develop a strategy to preventive actions like lifestyle modification, dietary restriction, etc (Chou *et al*., 2016). For early detection of dyslipidaemia at a younger age, the frequency of screening test and screening interval could not be fixed. The temperament of an individual may be helpful in the screening of asymptomatic dyslipidaemia. This tool could be used as a prophylaxis measure to reduce morbidity and mortality due to CVD.

Our study shows that the occurrence of dyslipidaemia may be predicted in an individual by one's temperament. Although, this observation is a preliminary one. It needs further confirmation by other case control and cohort studies. Moreover, this study had several limitations. The sample size of this study was small. The influence of biases and unknown confounders may not be ruled out due to lack of control group in this study. In addition, we could not calculate relative risk and odd ratios which can establish the relationship between dyslipidaemia and temperament of an individual.

CONCLUSION

The present study showed the clinical patterns of dyslipidaemia among the participants of the study. They were at high risk for development of hypertension, ischaemic heart disease, diabetes mellitus and stroke. Lack of awareness among the participants about the dyslipidaemia and its complications may lead to high morbidity and mortality due to cardiovascular diseases. A strategy to tackle with this widely prevalent disease should be developed to reduce the burden on the health care delivery system.

This study demonstrates that there is congruence between the concept of temperament and the prediction of dyslipidaemia in an individual. This relationship between temperament and dyslipidaemia could be used as a strategy to screen dyslipidaemic patients at an early stage. The rising trends of cardiovascular diseases demand such a strategy to prevent morbidity as well as mortality. The phlegmatic individual may be counselled for regular screening and adoption of preventive measures. This approach could be a good tool for health promotion and disease prevention. The physiological profile, psychological and emotional states of an individual is unique which can be scientifically observed. So, every individual behaves differently to different stimuli such as foods, drugs, etc. The temperament may guide the physicians to advise precautionary measures to the phlegmatic individual for maintaining a healthy life and individualized treatment regimes.

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CONFLICT OF INTEREST

Authors declare that there is no conflict of interest

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